

Response to Office Action mailed September 16, 2004
U.S. Application No. 09/812,184

REMARKS

In the office action, the examiner rejected claims 1-4 and 6-13 as anticipated by U.S. Patent 3,924,680 to Terry; claims 1 and 3-5 as anticipated by U.S. Patent 3,599,714 to Messman; and claims 1 and 3-5 as anticipated by U.S. Patent 2,584,605 to Merriam, et al. Applicants respectfully traverse such rejections by the examiner of all of Applicants' claims, and request the examiner reconsider and re-examine the application in light of the following comments.

Applicants contend that the examiner has misunderstood the teachings of Terry, Messman and Merriam, or the teachings of the present application, or both.

One fundamental difference between the present application and the Messman and Merriam patents is that Applicants teach and claim a method for accelerating the conversion or maturation of kerogen to hydrocarbons, which would then be produced by conventional methods. The phrase "accelerating the conversion of kerogen to hydrocarbons" appears in all of Applicant's claims. Messman and Merriam teach production methods for secondary recovery in tight oil sands; i.e., maturation into hydrocarbons is complete but production is difficult.

Attention is directed to the upper part of page 2 in the present application. Shale (a type of impenetrable rock) may contain a "hydrocarbon precursor" called kerogen. The kerogen is tightly bound within the rock, but slowly gets converted to hydrocarbons when exposed to temperatures on the order of 100°C. The process is extremely slow and takes place on a geologic time scale. Applicants' invention is a method of speeding up this maturation process so that it occurs in perhaps 5-10 years (see Fig. 3) instead of thousands of years.

Terry teaches *in situ* pyrolysis and gasification of coal. Gasification is a method of producing the hydrocarbons in coal in the form of gases such as Benzene, Toluene, etc. (see col. 2, lines 43-48). Heat is applied to the coal stratum. As the temperature is raised to 300°C, volatiles vaporize into condensable gases (col. 3, lines 50-51). However, it could be argued that pyrolysis matures the coal to a higher rank coal.

Messman proposes *in situ* combustion of coal, recovering generated hydrocarbon gases and using the heat to aid in production of underlying or overlying tight oil sands. This is a production method that is not intended to mature coal or oil that is already mature. Messman discloses embodiments in which the coal layer is separated from the oil sands layer by a kerogen layer. However, the purpose of the kerogen layer is to conduct the heat from the combusted coal to the oil sands layer where it reduces the viscosity of the oil and makes it more producible (see, for example, col. 7, lines 68-72). Messman does not teach accelerating the maturation of the kerogen.

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Merriam discloses a method similar to Messman's (with no mention of intervening kerogen layers). See col. 3, lines 52-61.

With the possible exception of Terry, none of these prior art documents teach or suggest that the conversion of kerogen to hydrocarbons can be accelerated by generating heat in the vicinity of the formation. Therefore, none of these documents anticipate Applicants independent claims 1, 9 and 13, and therefore do not anticipate any of the dependent claims.

Besides the fact that Applicants' method is not a production method, there is another fundamental distinction between the present application and the cited art. All three references teach either pyrolysis, combustion or burning of coal. The examiner contends that "applicants' definition of 'reservoir formation' and 'kerogen' are broad enough to encompass coal." It is not relevant whether "kerogen" could encompass coal or not because kerogen is not the heat source in Applicants' method. Referring to the claims in the present application, the heat source is "reservoir-quality strata" or a "reservoir formation containing hydrocarbons." The term "reservoir" is defined simply as "rocks containing oil and gas." (Sheriff's *Encyclopedic Dictionary of Exploration Geophysics*) It is not a coal term. See also page 6, lines 26-28 of the present application: "Similarly, the phrases 'reservoir strata' or 'reservoir formation' or the word 'reservoir' refers to any geologic formation having sufficient porosity or permeability such that it contains or is capable of containing hydrocarbons such as oil or gas." Also, see page 7, lines 21-23: "For example, to be considered reservoir-quality strata the rocks should have permeability that is at least approximately 10^{-6} Darcy and a porosity at least approximately 5%." Neither Terry, Messman nor Merriam teaches generating heat by combustion of oil or gas in a reservoir layer, and therefore none of these references can possibly anticipate Applicants' claims.

Only Merriam suggests that instead of the coal or lignite that is clearly his lead case, the heat may be produced by burning "other combustible organic matter." There is no teaching that the combustible organic matter needs to be oil or gas in a reservoir. Furthermore, Merriam's method is a thermal drive method for the recovery of oil from oil sands, as stated in his title and first paragraph. It is not a method for accelerating the maturation of kerogen. Oil sands are not kerogen-containing shale or other source rock. The oil in oil sands is already mature. Instead, the problem is as Merriam explains it in column 2. Eventually normal oil production methods in any oil field must meet diminishing returns because heavier hydrocarbons in the oil clog the pores of the sands. Heating will lower the viscosity of the heavier hydrocarbons, tending to unclog the pores. He proposes burning a nearby layer of "coal or the like" to generate such heat. None of this has anything to do with "accelerating the conversion of kerogen to hydrocarbons" (quote from Applicants' claims 1, 9 and 13).

In summary, the three prior art methods either (1) are heat-driven secondary recovery or other production techniques or (2) use combustion of coal as the heat source, or both. Either characteristic is sufficient to distinguish them and prevent anticipation of Applicants' claimed invention.

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CONCLUSION

Each of the claims of the application is limited to Applicants' inventive method for accelerating the conversion of kerogen to hydrocarbons. Each of these claims is believed to be patentably distinct from all known prior art, including all art cited by the examiner. Therefore, Applicants respectfully request allowance of all pending claims. If the examiner wishes to discuss this application with counsel, please contact the undersigned.

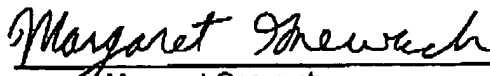
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